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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
ZERVIGON, RUDY	
ART UNIT	**PAPER NUMBER**
1763	

DATE MAILED: 08/03/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/788,365	NI ET AL.	
	Examiner	Art Unit	
	Rudy Zervigon	1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 May 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *25 and 28-45* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *25 and 28-45* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *5/14/2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

2. Claims 25, 29, 33, 34, 37, 38, 42, and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishii (USPat. 5,685,942) in view of Li et al (USPat. 5,772,771) and Horie, Kuniaki et al (US 6,132,512 A).

Ishii teaches a dielectric gas injector (85, Figure 4) supplying process gas into a plasma processing chamber (82; column 7, line 63 - column 8, line 22) wherein a semiconductor substrate ("W") is subject to plasma processing (column 3, lines 28-50). The gas injector further comprises a gas injector body (85, Figure 4) sized to extend through a chamber wall (83) of the processing chamber. As shown in Figure 4, the axial planar distal end surface (surface containing ports 87) of the gas injector body is exposed within the processing chamber. Figure 4 shows that the gas injector body includes a plurality of gas outlets (87) adapted to supply process gas into the processing chamber.

Figure 4 shows that the gas outlets of the gas injector body (85, Figure 4) are located at an axial end surface (surface containing ports 87) of the gas injector body. The gas outlets further including wherein the gas outlets are located are located in the axial distal end surface of the gas injector body.

Ishii further teaches that the gas injector includes a planar axial end surface (surface containing ports 87; Figure 4) that is flush with an interior surface of a dielectric window (83; "insulating material"; column 8, line 7) forming a chamber wall. Ishii also teaches a surface (flange portion of 85, Figure 4) adapted to overlie an outer surface of the chamber wall.

Ishii does not teach gas outlets further including a plurality of angled gas outlets extending at an acute angle to the axial direction. Ishii further does not teach a pressure difference across his gas injector (85, Figure 4) orifice sustaining gas velocities in excess of sonic gas velocities.

Li teaches a gas injector (Figure 1A) supplying process gas into a plasma processing chamber (18; column 3, lines 20-47). The gas injector further comprises a gas injector body (56a/64, Figure 1) sized to extend through a chamber wall (25) of the processing chamber.
As shown in Figure 1/1A, the distal end (64) of the gas injector body is exposed within the processing chamber. Figure 1A shows that the gas injector body includes three angled gas outlets (64) adapted to supply process gas into the processing chamber. Figures 1 and 1A shows that the gas outlets (64, Figure 1,1A) of the gas injector body (56, Figure 1) are located at an axial end surface (56) of the gas injector body. Specifically, Li teaches a plurality (3) of angled gas outlets (Figure 1A) extending at an acute angle to the axial direction. Li does not teach 8 angled gas outlets as claimed by claim 43. Li does not teach the acute angle of the gas injector as being between 10° to 70°.

Kuniaki teaches a gas passage (63; Figure 18a,b) within a gas distribution plate (64; Figure 18a) where, depending on the pressure difference ($P_1 - P_2$; column 16; lines 35-40) across Kuniaki's gas passage, gas velocities can be controlled.

It would have been obvious to one of ordinary skill in the art at the time the invention was made for Ishii to change the angle of a plurality of his gas outlets such that they extend at an acute angle between to 10° to 70° to the axial direction and add additional gas outlets as taught by Li, further to optimize the pressure processing conditions of the Ishii apparatus to produce gas velocities in excess of sonic gas velocities.

Motivation for Ishii to change the angle of a plurality of his gas outlets such that they extend at an acute angle between to 10° to 70° to the axial direction and add additional gas outlets as taught by Li is to process larger area substrates (column 5, lines 19-28), further to optimize the pressure processing conditions of the Ishii apparatus to produce gas velocities in excess of sonic gas velocities is to process larger area substrates (column 5, lines 19-28), and to optimize the operation of the claimed apparatus claims respectively. Further, it is well established that the duplication of parts is obvious (In re Harza , 274 F.2d 669, 124 USPQ 378 (CCPA 1960) MPEP 2144.04). With respect to the processing gas velocities and pressure operating conditions, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (Walter , 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (In re Casey,152 USPQ 235 (CCPA 1967); In re Otto , 136

USPQ 458, 459 (CCPA 1963); MPEP2111.02). Alternatively, it would be obvious to those of ordinary skill in the art to optimize the operation of the claimed invention (In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980); In re Hoeschele , 406 F.2d 1403, 160 USPQ 809 (CCPA 1969); Merck & Co. Inc . v. Biocraft Laboratories Inc. , 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied , 493 U.S. 975 (1989); In re Kulling , 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990), MPEP 2144.05).

3. Claims 28, 30-32, 35, 36, 39, 40, 43, and 44 are rejected under 35 U.S.C. 103(a) as being obvious over Ishii (USPat. 5,685,942) and Li et al (USPat. 5,772,771), in view of Rossman et al (USPat. 6,077,357) and Horie, Kuniaki et al (US 6,132,512 A).

Ishii, Li, and Horie are discussed above. However, Ishii, Li, and Horie do not teach a first O-ring seal in a surface of the flange for sealing against the outer surface of the chamber wall. Ishii and Li do not teach a second O-ring seal on an outer surface of the gas injector body. Ishii and Li further do not teach a gas injector for supplying process gas at sonic velocity.

Rossman teaches a gas injection nozzle (302; Figure 14) including a first O-ring seal (326) in a surface of the flange for sealing against the outer surface of the chamber wall (314). Rossman further teaches a second O-ring seal (322, 324; Figure 14) on an outer surface of the gas injector body.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to add an O-ring seal in a surface of the flange for sealing against the outer surface of the chamber wall and to add a second O-ring seal on an outer surface of Ishii's gas injector body, further to optimize the pressure processing conditions of the Ishii apparatus to produce gas velocities in excess of sonic gas velocities.

Motivation to add an O-ring seal in a surface of the flange for sealing against the outer surface of the chamber wall and to add a second O-ring seal on an outer surface of Ishii's gas injector body, and to flow the process gas at sonic velocity as taught by Rossman is to provide for vacuum integrity as taught by Rossman (column 17, lines 54-56).

With respect to the processing gas velocities and pressure operating conditions, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (Walter , 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (In re Casey,152 USPQ 235 (CCPA 1967); In re Otto , 136 USPQ 458, 459 (CCPA 1963); MPEP2111.02). Alternatively, it would be obvious to those of ordinary skill in the art to optimize the operation of the claimed invention (In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980); In re Hoeschele , 406 F.2d 1403, 160 USPQ 809 (CCPA 1969); Merck & Co. Inc . v. Biocraft Laboratories Inc. , 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied , 493 U.S. 975 (1989); In re Kulling , 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990), MPEP 2144.05).

4. Claim 41 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ishii (USPat. 5,685,942) and Li et al (USPat. 5,772,771) in view of Kawase et al (USPat. 5,734,143) and Horie, Kuniaki et al (US 6,132,512 A). Ishii and Li are discussed above. Ishii further teach his gas injector (85; Figure 4) including a uniform diameter central bore (88a) extending axially

from an upper axial end face (top surface 85) of the gas injector body, the central bore being defined by a cylindrical sidewall and a flat endwall (bottom surface 85).

Ishii and Li do not teach that the inlets of the gas outlets (87) are located on the flat endwall. Ishii and Li do not teach a pressure difference across Ishii's and Li's gas injector orifice sustaining gas velocities in excess of sonic gas velocities.

Kuniaki teaches a gas passage (63; Figure 18a,b) within a gas distribution plate (64; Figure 18a) where, depending on the pressure difference ($P_1 - P_2$; column 16; lines 35-40) across Kuniaki's gas passage, gas velocities can be controlled.

Kawase teaches a plasma torch head nozzle (Figure 2; column 5, line 66 – column 3, line 31). Inclusive, Kawase teaches a gas injector (Figure 2) including a uniform diameter central bore (along axis 70) extending axially from an upper axial end face (top of 11) of the gas injector body, the central bore being defined by a cylindrical sidewall and a flat endwall (bottom of 11) where the inlets of the gas outlets (10) are located on the flat endwall.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to replace Ishii's injector body with Kawase's injector body, further to optimize the pressure processing conditions of the Ishii apparatus to produce gas velocities in excess of sonic gas velocities.

Motivation to replace Ishii's injector body with Kawase's injector body is to form stable plasmas as taught by Kawase (column 2, lines 10-15), further to optimize the pressure processing conditions of the Ishii apparatus to produce gas velocities in excess of sonic gas velocities is to optimize the operation of the claimed apparatus claims respectively. With respect to the processing gas velocities and pressure operating conditions, it has been held that claim language

that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (Walter , 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (In re Casey,152 USPQ 235 (CCPA 1967); In re Otto , 136 USPQ 458, 459 (CCPA 1963); MPEP2111.02). Alternatively, it would be obvious to those of ordinary skill in the art to optimize the operation of the claimed invention (In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980); In re Hoeschele , 406 F.2d 1403, 160 USPQ 809 (CCPA 1969); Merck & Co. Inc . v. Biocraft Laboratories Inc. , 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied , 493 U.S. 975 (1989); In re Kulling , 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990), MPEP 2144.05).

Response to Arguments

5. Applicant's arguments with respect to claims 25, 28-38, and 42-45 have been considered but are moot in view of the new grounds of rejection.

6. Applicant quotes "much less than sonic velocity" as a showing by USPat. 4,612,077 that Ishii would not inject his process gases at velocities at, or in excess of, sonic velocities. In response, the Examiner believes that Applicant's argument does not remove the grounds of the rejections asserted above. For the reasons stated above the Examiner believes that, as demonstrated by Horie Kuniaki et al (US 6,132,512 A), there are arguments based on the intended use of the claimed structural components, or in the alternative, optimization of the claimed apparatus.

7. Rejections in view of McMillin are withdrawn after Applicant's statement of common ownership (page 9).

8. With respect to Applicant's argument that "Rossman fails to disclose or suggest injecting process gas at sonic velocities. Applicants submit that there is no tenable relationship between providing for vacuum integrity and flowing process gases at a sonic or supersonic velocity", the Examiner is not attempting to establish a relationship between vacuum integrity and processing conditions of claimed apparatus components. As demonstrated above, these issues are addressed separately as exemplified by the cited cases in support of intended use of the claimed apparatus claims and, in the alternative, the optimization of processing conditions of apparatus (Ishii) capable of performing the intended use.

9. With respect to Applicant's position:

"

Li provides no motivation to change the angle of a plurality of the gas outlets of Ishii while leaving unchanged a center, axial gas outlet. Neither Ishii nor Li suggest a gas injector having both a center gas outlet extending in the axial direction and a plurality of angled gas outlets extending at an acute angle to the axial direction wherein the gas outlets are located in the axial distal end surface of the gas injector, as recited in Claims 28 and 39.

"

The Examiner first asserted that Li teaches a plurality (3) of angled gas outlets (Figure 1A) extending at an acute angle to the axial direction and that it would have been obvious to one of ordinary skill in the art at the time the invention was made for Ishii to change the angle of a plurality - not necessarily all - of his gas outlets such that they extend at an acute angle between

to 10° to 70° to the axial direction and add additional gas outlets as taught by Li is to process larger area substrates (column 5, lines 19-28).

10. In response to applicant's argument that there is no suggestion to combine the references of Ishii (USPat. 5,685,942) in view of Li et al (USPat. 5,772,771), the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, there is teaching, suggestion, and motivation to combine the references – "Motivation for Ishii to change the angle of a plurality of his gas outlets such that they extend at an acute angle between to 10° to 70° to the axial direction and add additional gas outlets as taught by Li is to process larger area substrates (column 5, lines 19-28)..."

11. Applicant states:

"

Rossman discloses a Teflon seal 326 disposed inwardly of the channel in a recess 328 and not a seal for sealing against the outer surface of the chamber wall as recited in Claim 39 (see Rossman at column 17, lines 41-56 and Figure 14).

"

The Examiner disagrees. Rossman has an outer surface (outside of the chamber interior housing the substrate) of the chamber wall as the 314/326 interface.

Applicant states "The nozzles 302, 304 of Rossman are intended to be threaded in an inner chamber surface and thus teach away from an injector having an annular flange adapted to overlie and contact an outer surface of the chamber wall.", however, as asserted by the Examiner above, and the fact that Rossman's threading themselves does not render the location of Rossman's injector relative to an outer surface of the chamber wall, Rossman teaches an outer surface (outside of the chamber interior housing the substrate) of the chamber wall as the 314/326 interface.

Applicant states "Initially, Claim 41 depends from Claim 25 and thus is patentable over Ishii, Li and Kawase for at least the reasons that Claim 25 is patentable over Ishii and Li.". Applicant's amendments is inconsistent with Applicant's assertion. Claim 41 is now an independent claim.

With respect to Rossman, Applicant states:

"

The plate comprises a waveguide axis 70. However, the waveguide axis (central bore) is not defined by a cylindrical sidewall and a flat endwall extending between the cylindrical sidewall as claimed. Moreover, in the dielectric plate of Kawase, the inlets of the gas outlets are not located on the flat endwall.

" In this regard, it was stated that Ishii, not Rossman teaches "The gas injector further comprises a gas injector body (85, Figure 4) sized to extend through a chamber wall (83) of the processing chamber. As shown in Figure 4, the axial planar distal end surface (surface containing ports 87) of the gas injector body is exposed within the processing chamber. Figure 4 shows that the gas injector body includes a plurality of gas outlets (87) adapted to supply process gas into the processing chamber.... Ishii further teach his gas injector (85; Figure 4) including a uniform

diameter central bore (88a) extending axially from an upper axial end face (top surface 85) of the gas injector body, the central bore being defined by a cylindrical sidewall and a flat endwall (bottom surface 85)." That the Examiner states it would have been obvious to one of ordinary skill in the art at the time the invention was made to replace Ishii's injector body with Kawase's injector body, does not remove the structural characteristics of Ishii as discussed above.

Conclusion

12. Applicant's amendment necessitated the new grounds of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Rudy Zervigon whose telephone number is (571) 272.1442. The examiner can normally be reached on a Monday through Thursday schedule from 8am through 7pm. The official fax phone number for the 1763 art unit is (703) 872-9306. Any

Inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Chemical and Materials Engineering art unit receptionist at (571) 272-1700. If the examiner can not be reached please contact the examiner's supervisor, Gregory L. Mills, at (571) 272-1439.

7/29/14